

Simulator Evaluation of FMS Procedures for 2007 SDF CDAs

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Objectives

- **Evaluate “Spacing Friendly” CDAs into Louisville.**
 - Idle thrust from TOD to terminal entry.
 - Partial thrust descent legs in terminal area for speed flexibility.
- **Evaluate candidate pilot procedures for flying the CDAs using FMS guidance.**
 - FMS descent speed entry.
 - Speed intervention.

Simulator evaluation conducted at NASA Langley in September of 2006



LaRC Test Facility

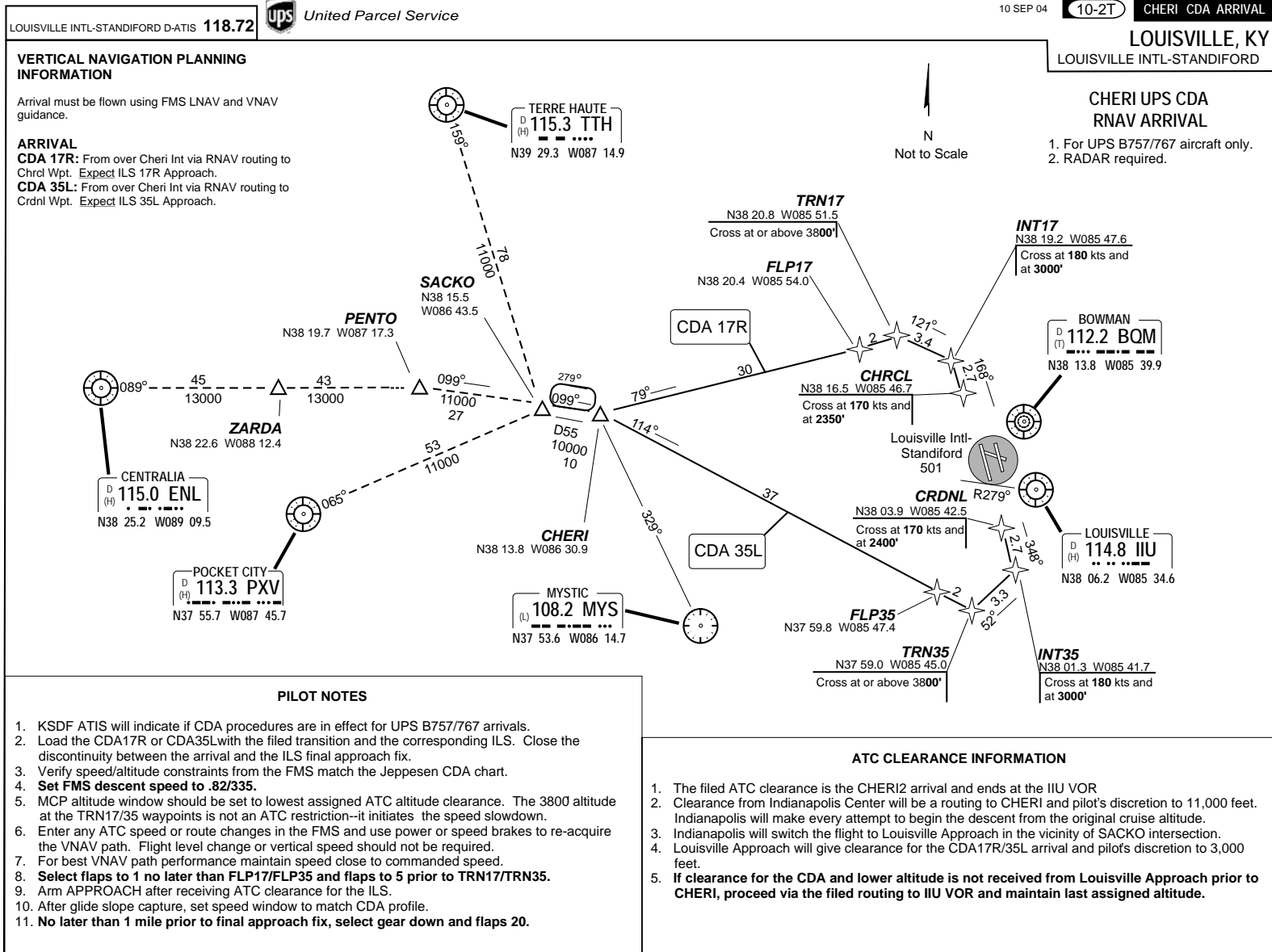
Integration Flight Deck (IFD) Simulator



6-DOF High Fidelity Jet Transport simulation with Commercial FMC



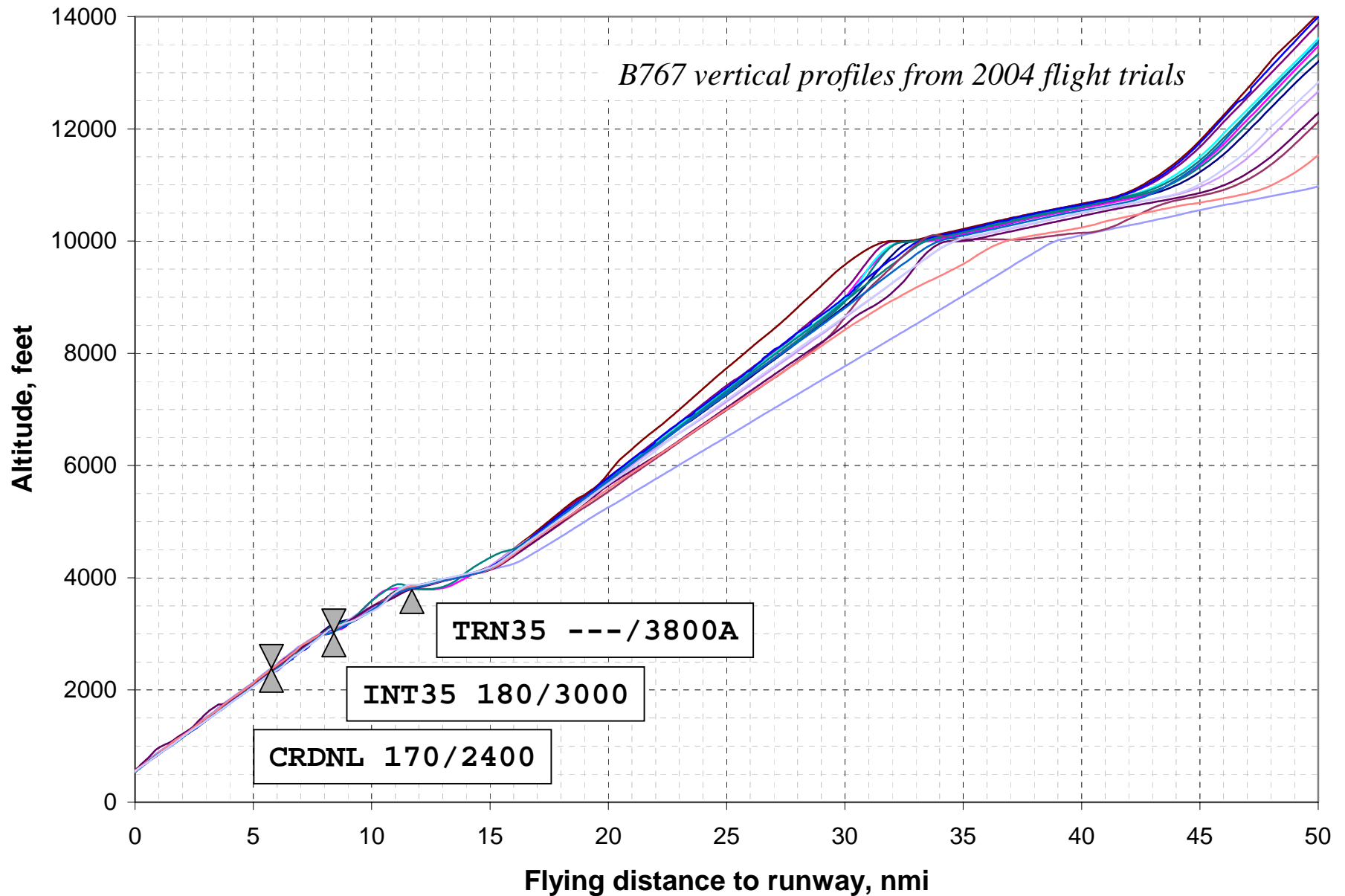
SDF 2004 CDA Arrival Chart



CHANGES: New Page.

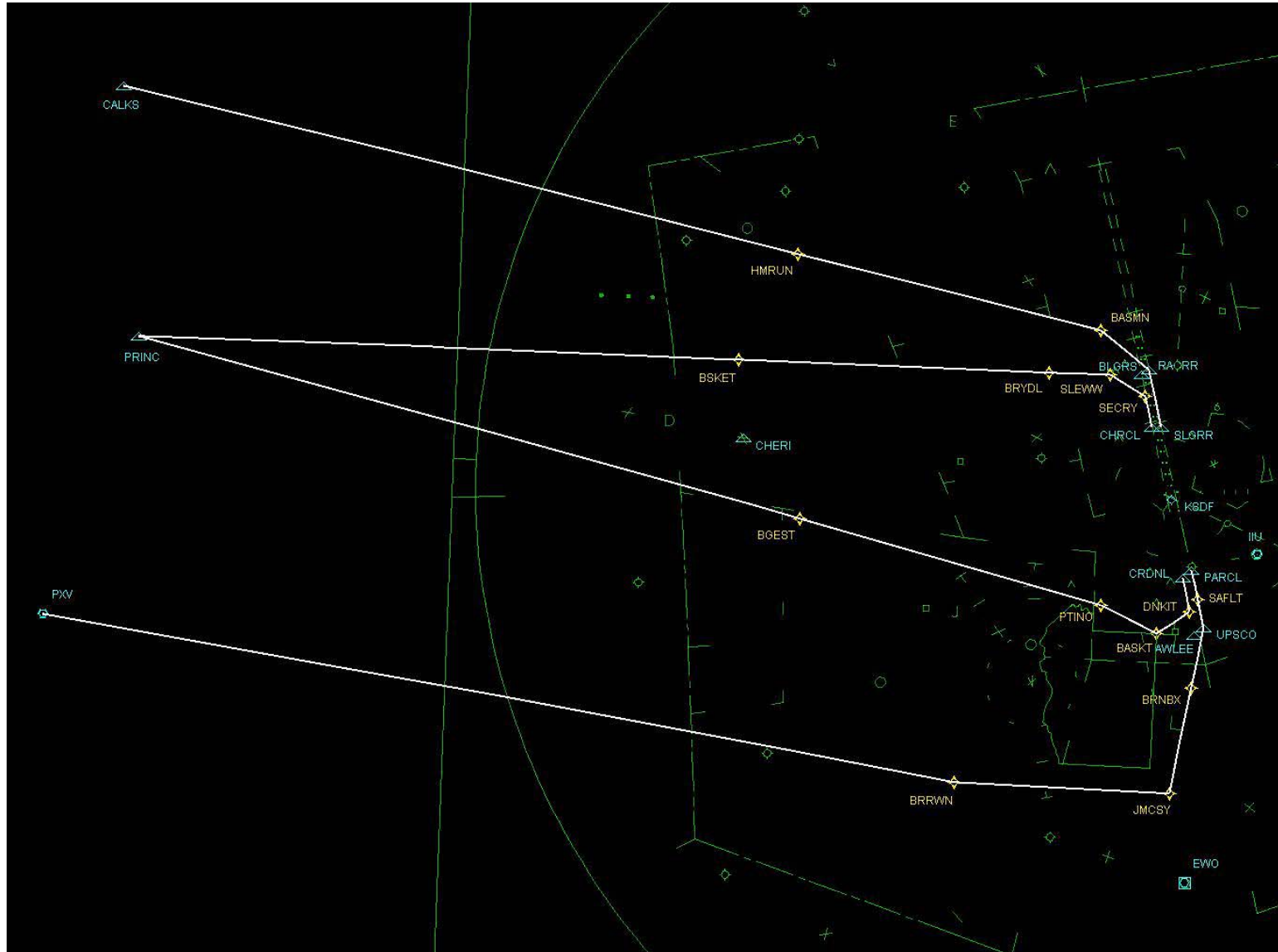


2004 CDA35L Vertical Profile



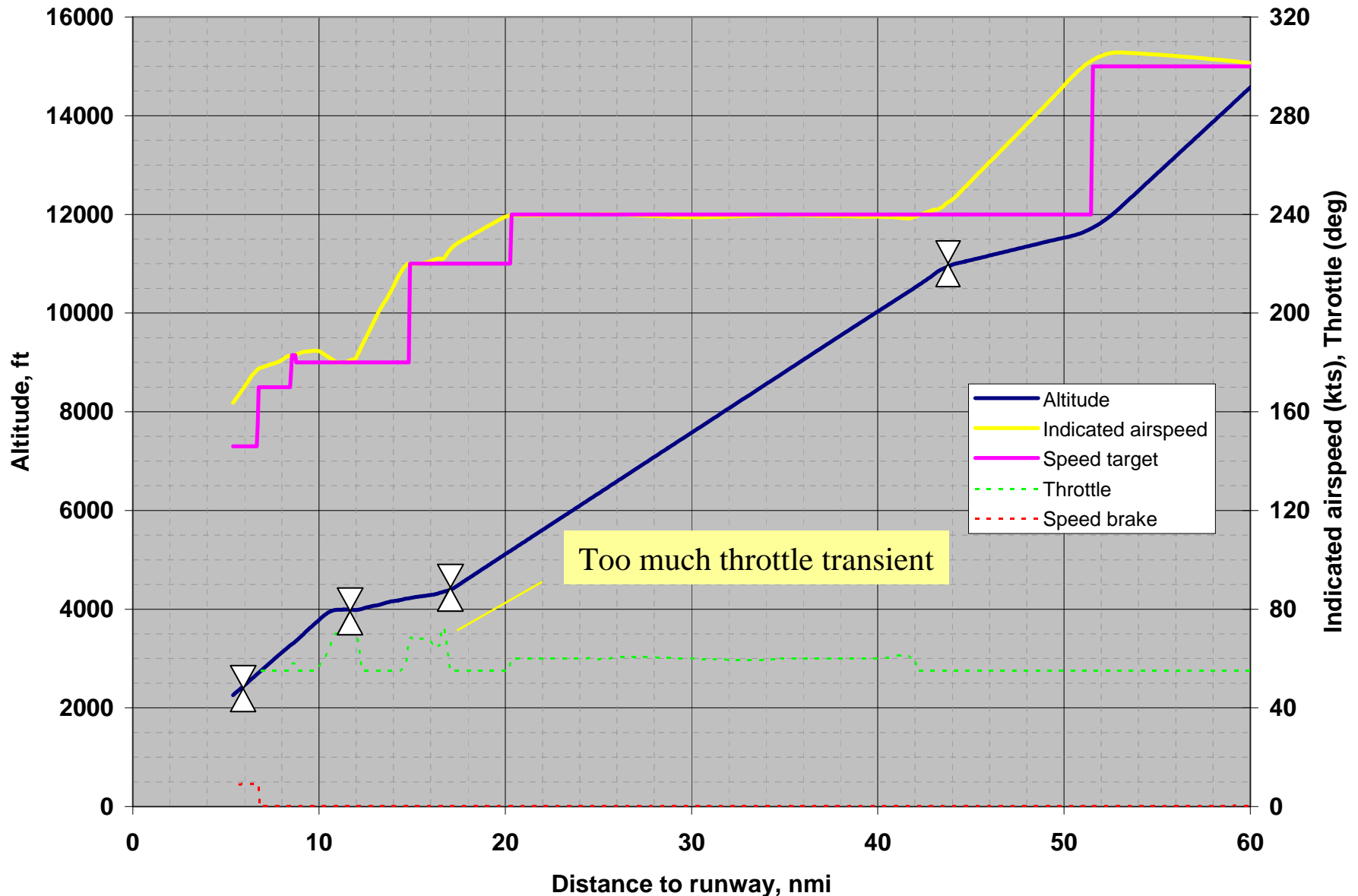


SDF 2006 STAR Design



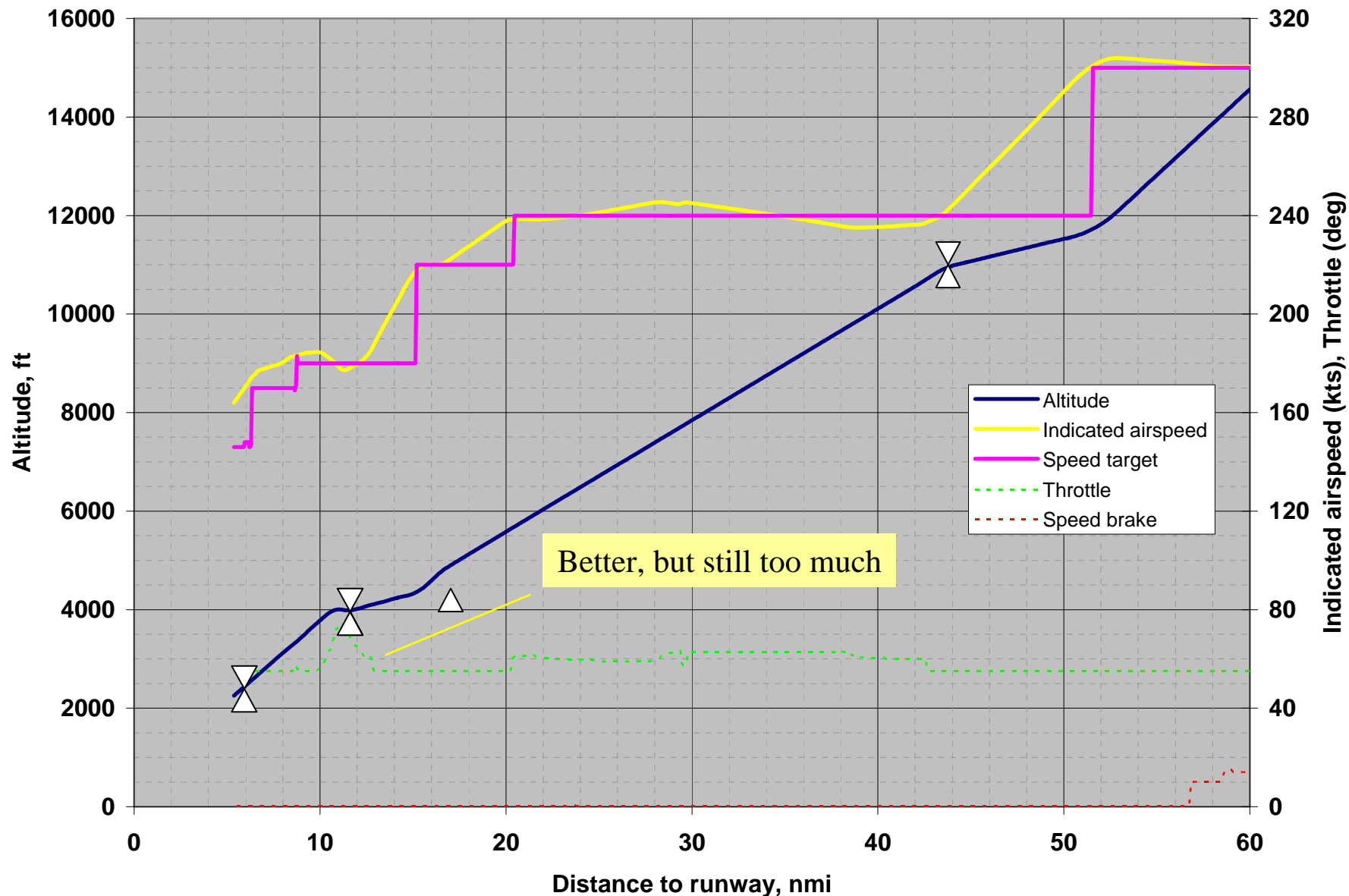


TRACON Profile - Hard Altitude Constraints



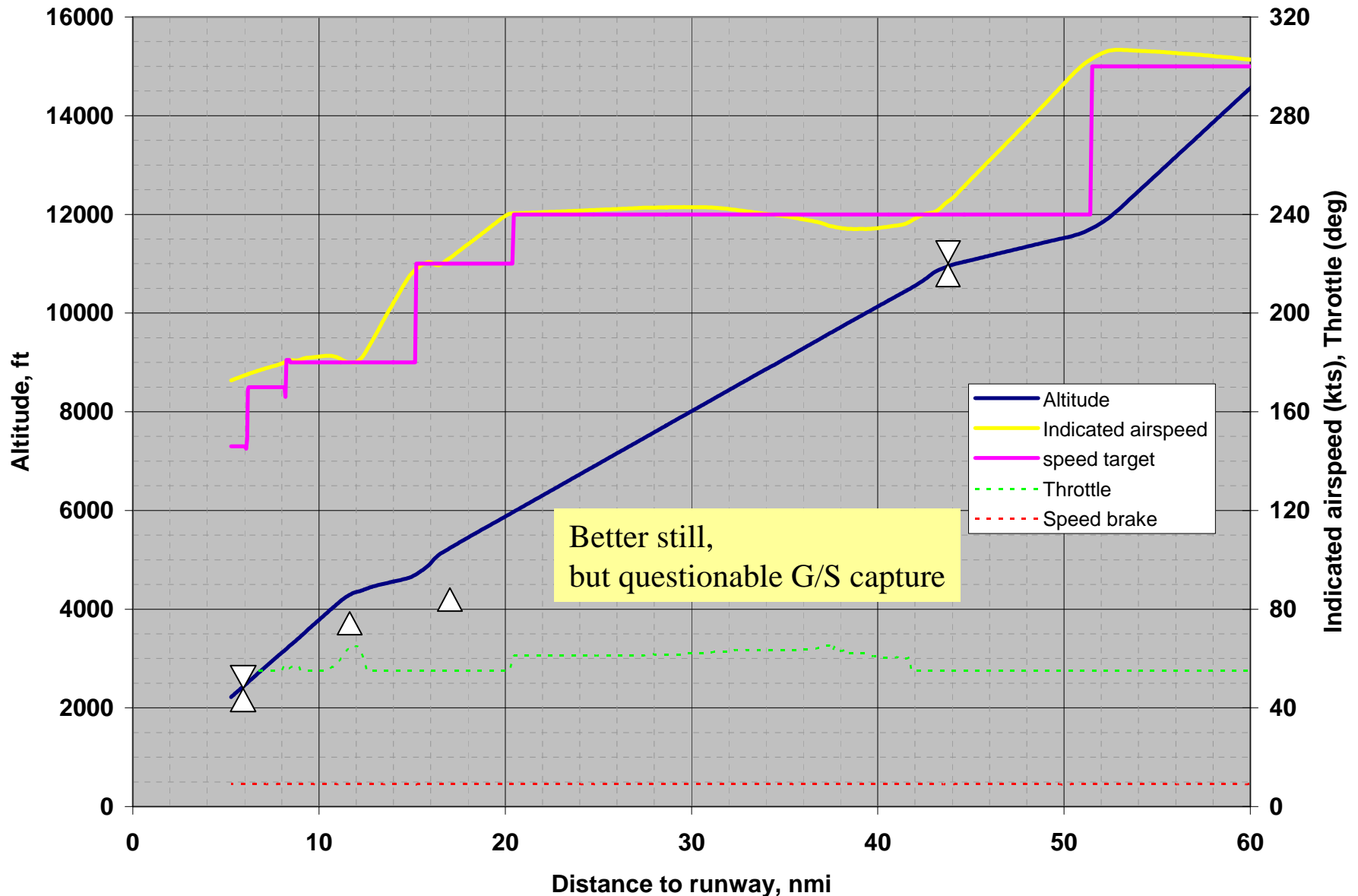


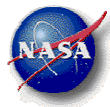
TRACON Profile – “AT or Above” 4400’ Constraint



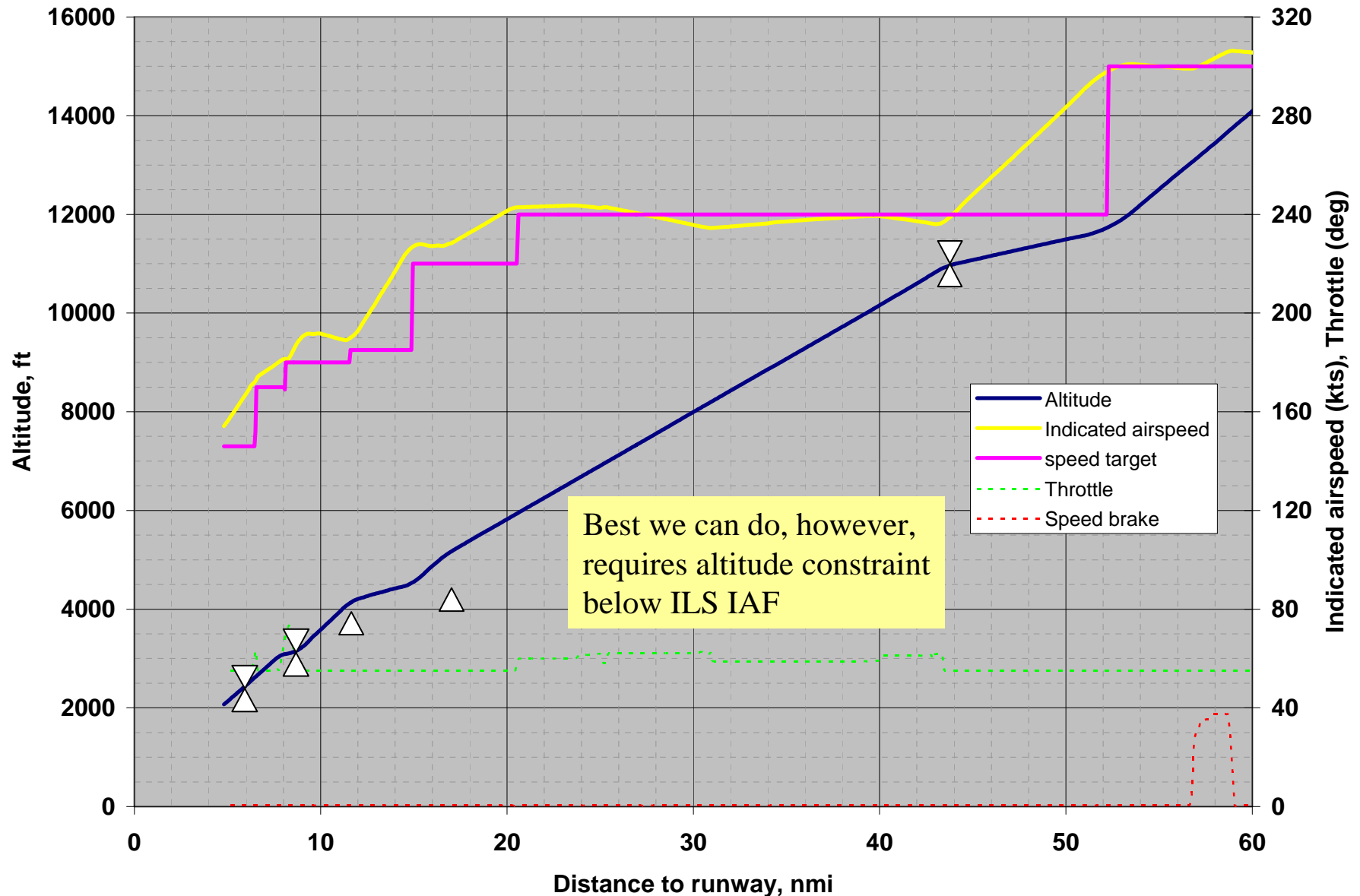


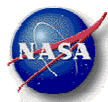
TRACON Profile – “At or Above” Constraints



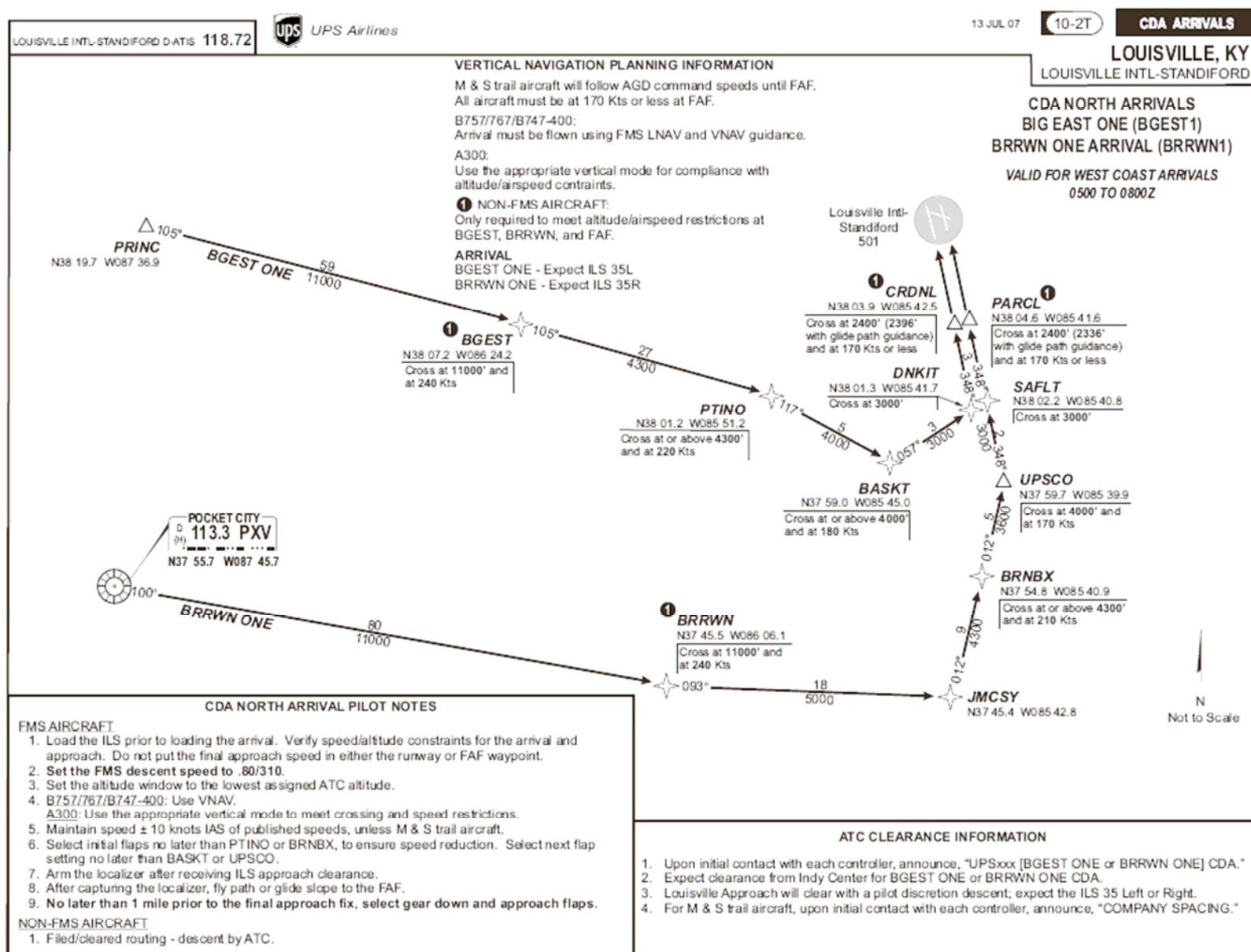


Hard Altitude Constraint for G/S Intercept



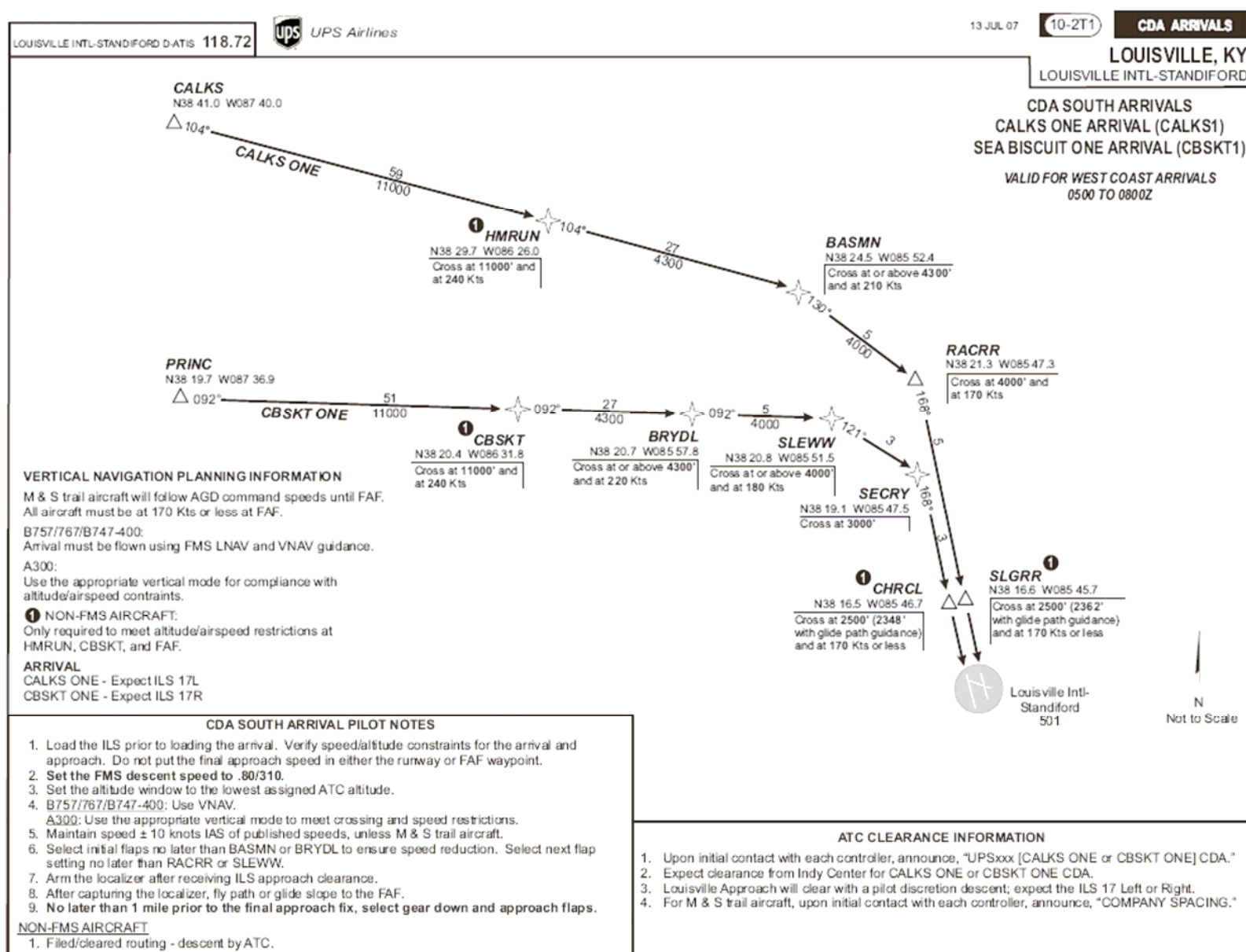


UPS 2007 CDA Arrival Chart (North Arrivals)



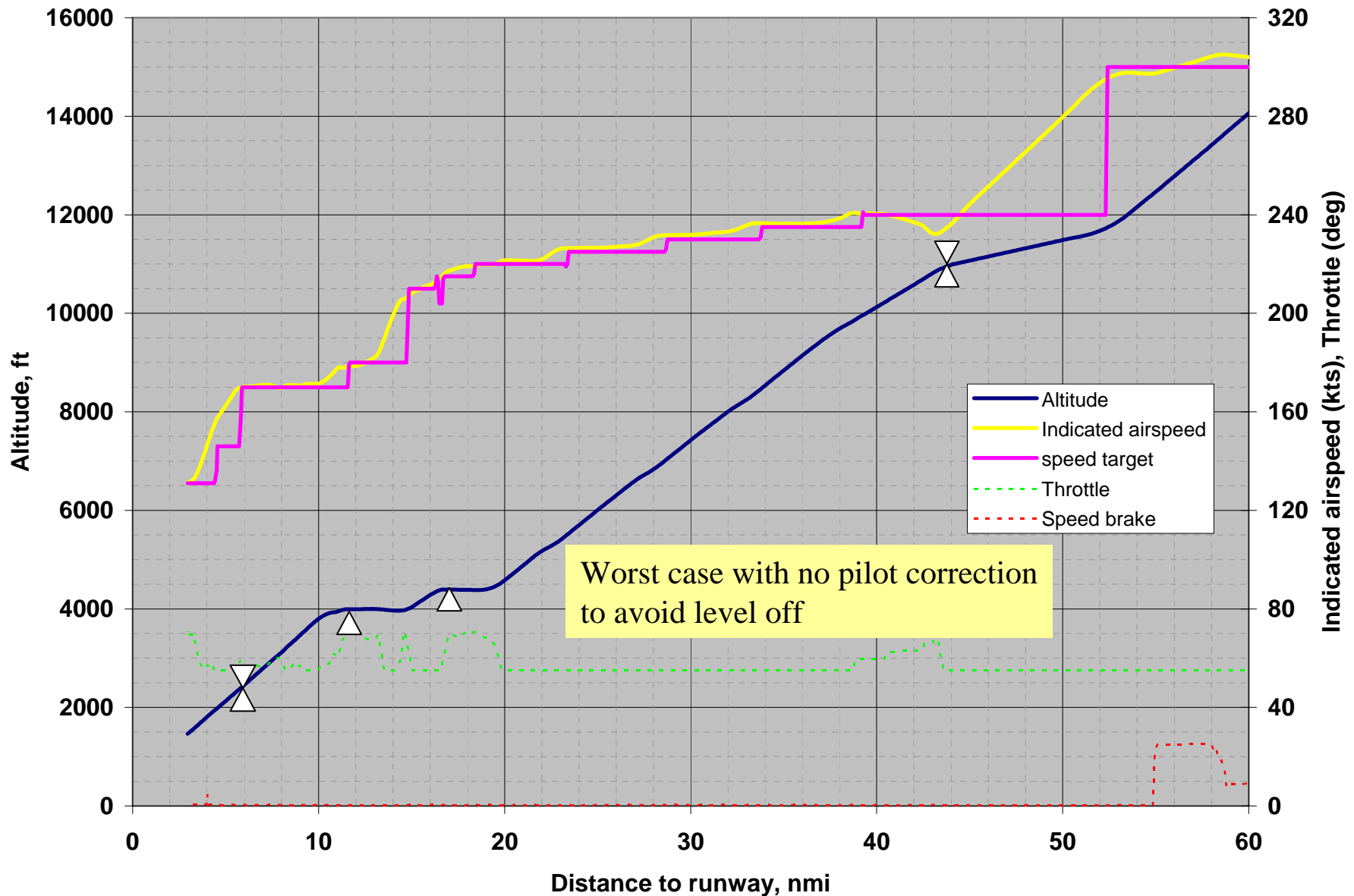


UPS 2007 CDA Arrival Chart (South Arrivals)



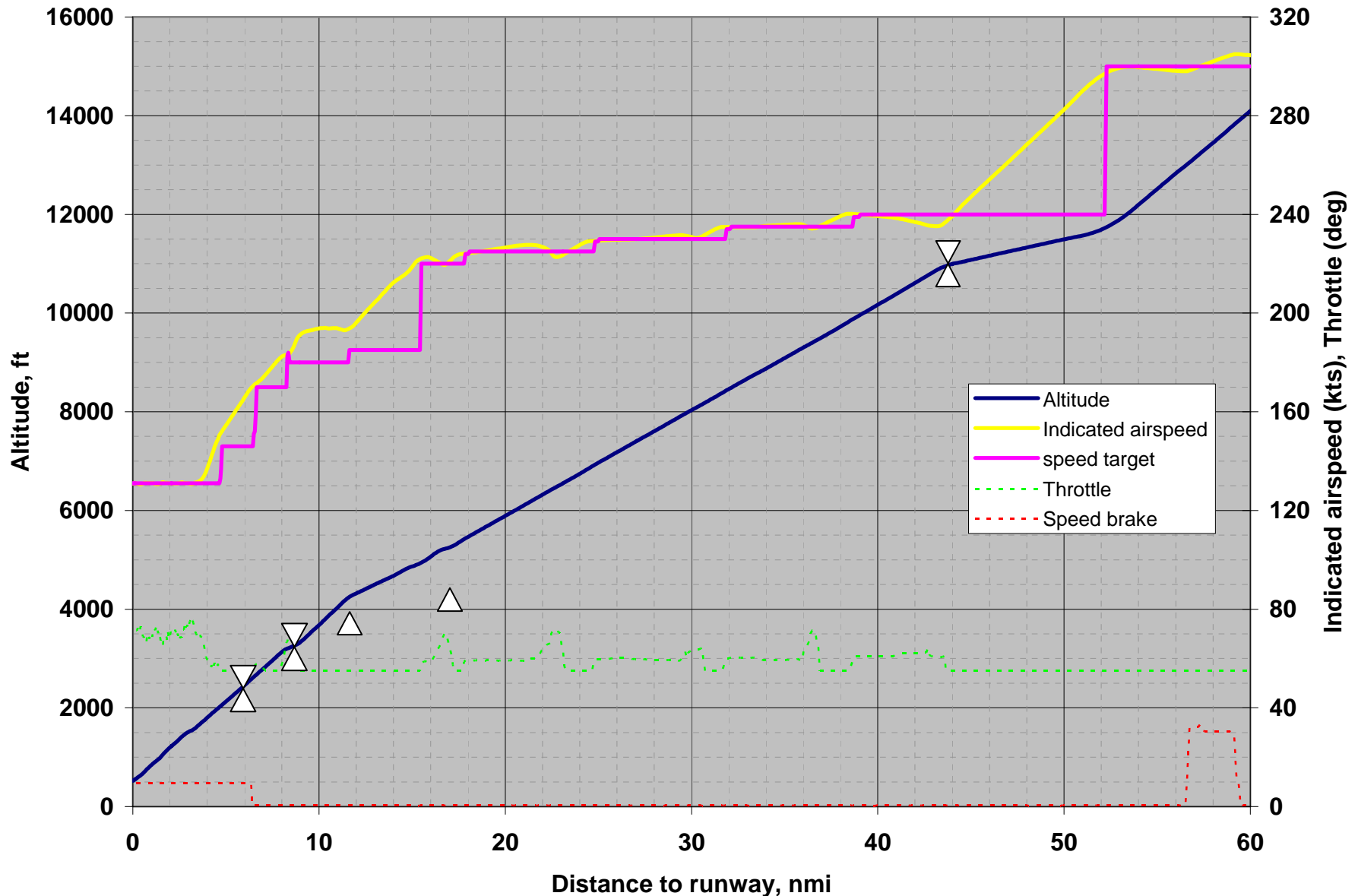


Speed Intervention – “At or Above” Constraints



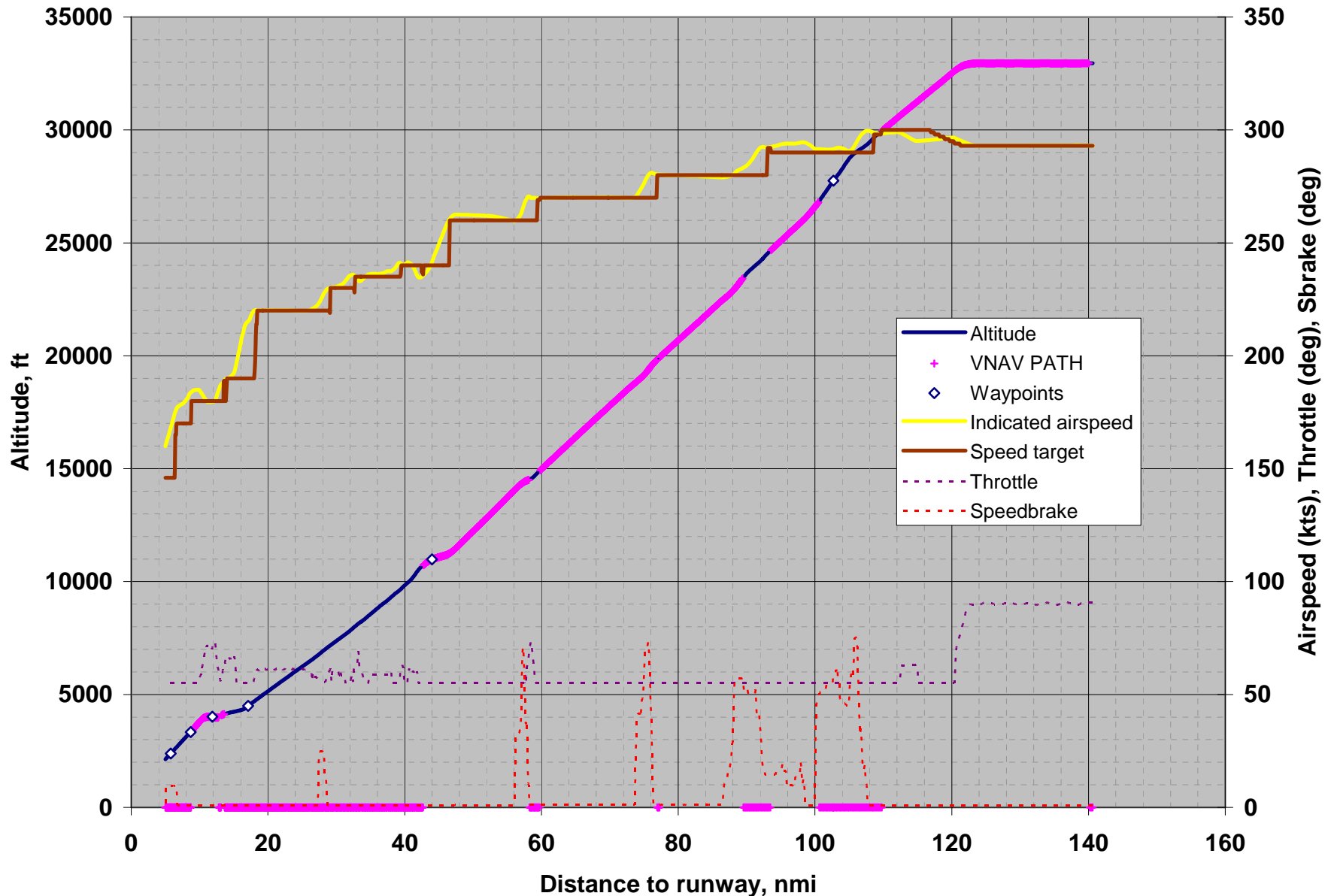


Speed Intervention Along Fixed FPA (old 757)



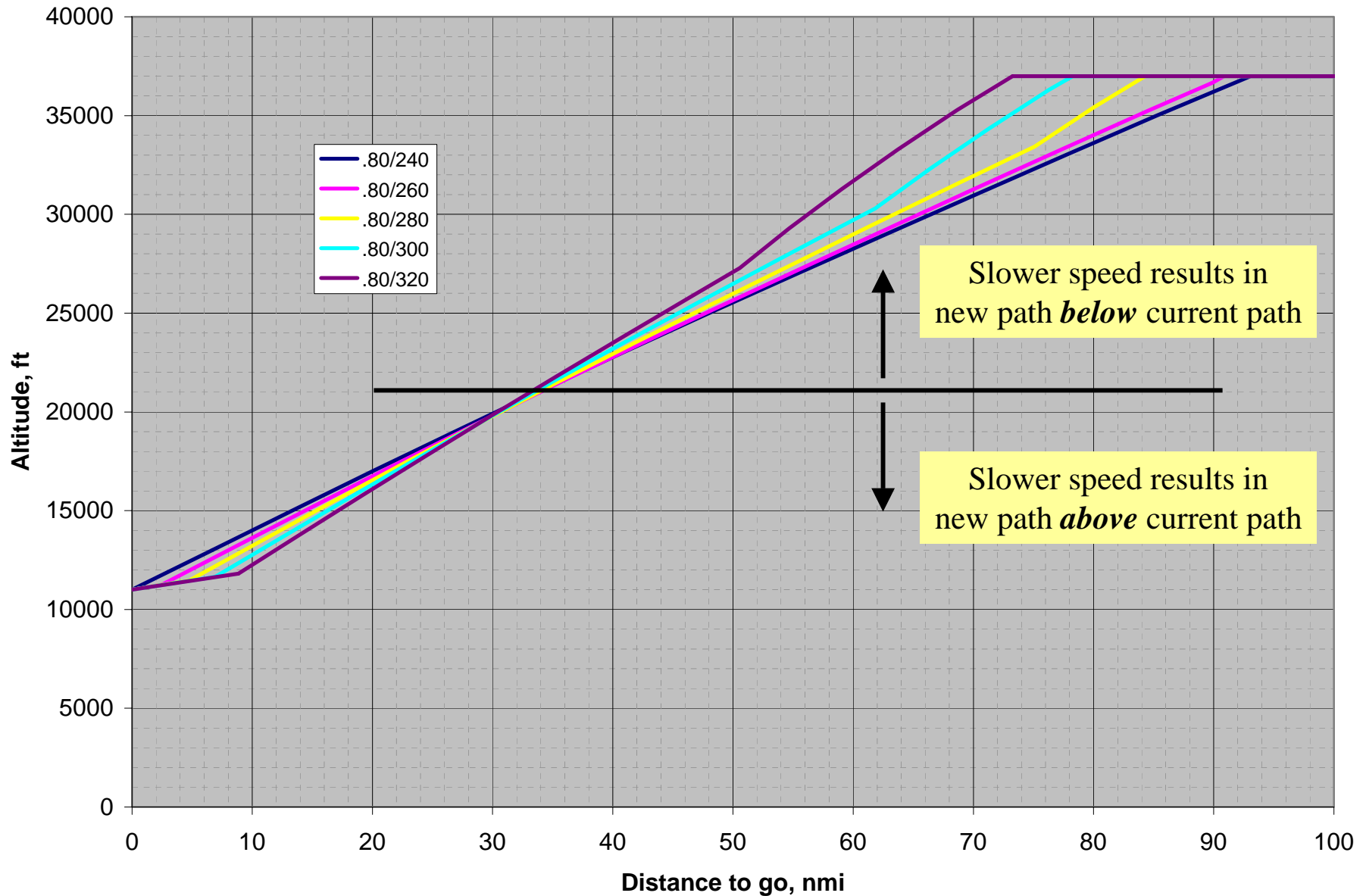


FMS Speed Change During Idle Descent



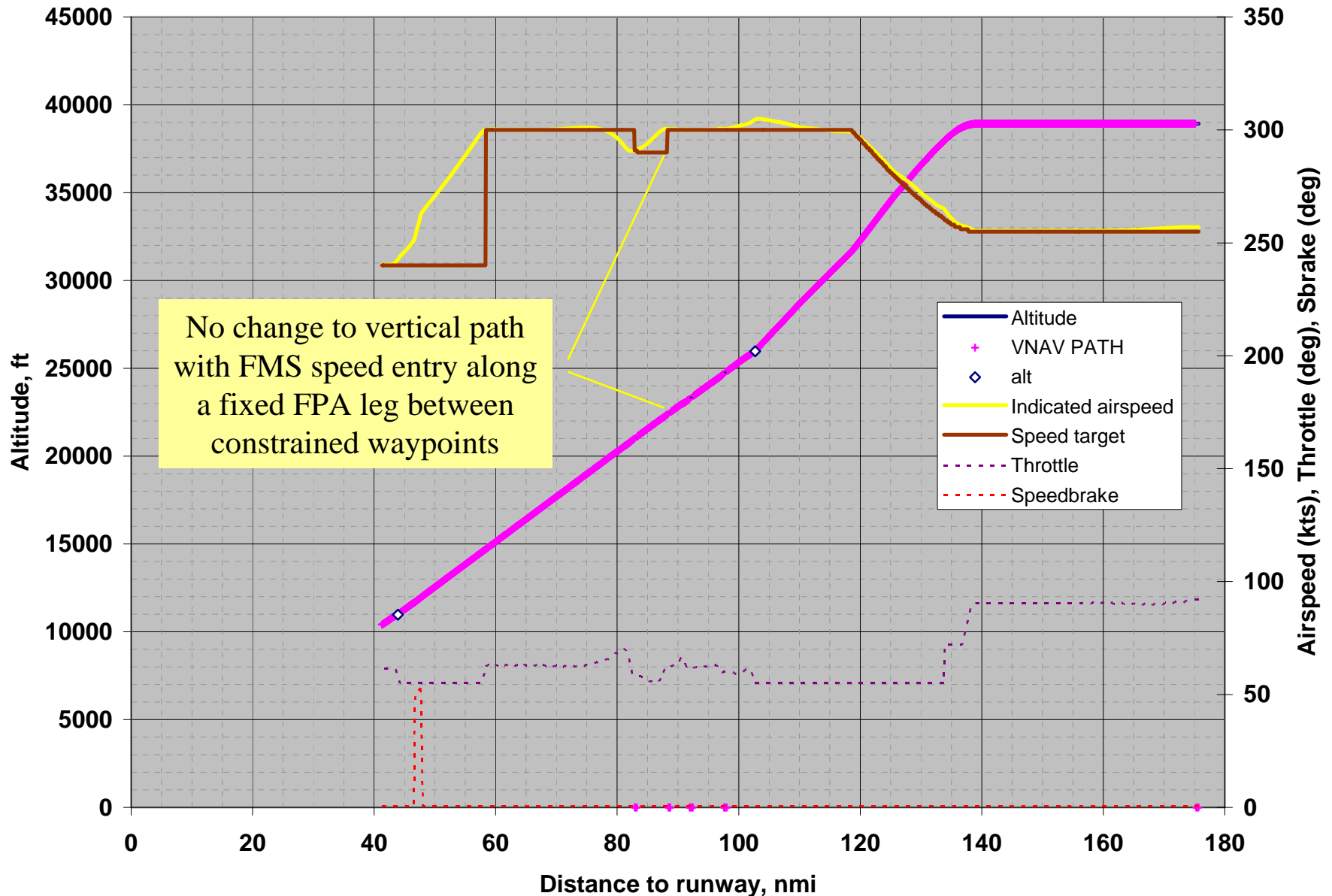


757 Idle Descent Variations With Speed





Speed Recalculation After Constraint





Summary

- **“Spacing friendly” CDAs were designed and tested using the Langley IFD cockpit simulator.**
- **Use of “At or Above” altitude constraints reduced the throttle transients.**
- **Changes to FMS descent speed were practical during early portions of the descent.**
 - Change to FMS descent path not always intuitive.
- **Speed intervention also practical.**
 - Pilot must manually manage thrust to maintain path.
- **UPS has initiated flight trials of CDAs.**
- **LaRC is currently testing CDAs with spacing guidance.**